

Environmental Guidelines for the Design and Maintenance of Golf Courses

Baltimore County, MD

Environmental Protection and Resource Management

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SECTION 1. STREAM, WETLAND, AND HABITAT PROTECTION

I. ENVIRONMENTAL CONSTRAINTS ANALYSIS

A. Existing Conditions Survey

The applicant will conduct a survey to determine the existing environmental conditions on the site. The applicant will prepare and submit to the Department of Environmental Protection and Resource Management (DEPRM) a report with accompanying plans which provides the following information:

1. Field located streams, ponds or other waterbodies;
2. Name of watershed and subwatershed, Stream Use Class designation;
3. Field located wetlands including documentation of vegetation, soils, and hydrology;
4. Wetlands classifications (Cowardin);
5. Calculated 100-year floodplain;
6. Topography with slopes differentiated as #10%, 11-19%, and \$20%;
7. Existing land cover (e.g., forest, meadow, old field, etc.);
8. Location of significant plant and/or animal habitat including: documentation of species, date of last known siting, status, and source of documentation.

B. Application of Regulations and Policies

After verification of the existing environmental conditions by DEPRM, the applicant will identify on the plan those areas of the site that would be restricted from development by: 1) application of the forest buffer standards outlined in the Executive Order, June 4, 1989, Regulations for the Protection of Streams, Wetlands, and Floodplains, 2) denoting those areas of significant habitat determined to exist on site that will be preserved, and 3) denoting those existing forest areas that will be preserved to meet the forest clearing limits outlined in these guidelines.

II. DESIGN STANDARDS

A. Preliminary Plan

After the applicant has determined those areas restricted from development, a plan should be prepared for submission to DEPRM that shows the proposed lay-out of the golf course. This plan should include the following:

1. Tees, greens, fairways, and practice range;
2. Buildings (e.g., clubhouse, maintenance facilities, etc.);
3. Roads and parking lots'

4. Conceptual design for the management of stormwater runoff and water quality including locations and methods and documentation that these locations and methods are practical; and
5. Location of irrigation wells and/or ponds.

The objective is to design the golf course so that there are no encroachments on the areas restricted from development and to minimize the impact of the overall site development on the natural resources of the area.

B. Variances to Forest Buffer Standards

If any of the above facilities would require encroachment on forest buffers, streams, wetlands or floodplains, a variance of the standards must be granted by DEPRM. Any variance must meet the following conditions:

1. Fairways Crossings
 - a. Fairways should be sited to reduce the number of crossings. Crossings should be limited to a maximum of two (2) for each 1,000 feet of stream length.
 - b. Fairways should be sited to eliminate or minimize the need to clear forest on steep or erodible slopes (Figure 1).
 - c. Fairways should cross perpendicular to the stream, wetland, etc. (Figure 2). The objective is to minimize the clearing of forest canopy over the stream and limit the conversion of forested wetlands to shrub-scrub or emergent wetlands.
 - d. Fairways will not require filling or grading in buffers, wetlands, or floodplains.
 - e. In cases where lack of topographic relief requires clearcutting of trees, this may be permitted; however, that portion of the fairway in the buffer, wetlands, or floodplains must be maintained as an unplayable rough (Figure 3). The vegetation will be maintained as shrub-scrub or herbaceous with a concentration of shrubs and small trees along the stream banks to provide shading and stream bank stability.
 - f. Cart paths will be timber, or timber pilings, (no wider than 6 to 8 feet in width) where they cross wetlands. Cart paths will not be located along steep or erodible slopes. Minimal clearing will be allowed, the design should weave around trees (Figure 4).
2. Buildings and parking lots will not be located in stream buffers, wetlands or floodplains.
3. Stormwater and water quality management facilities will not be located in stream buffers, wetlands or floodplains.

C. Ponds

1. Ponds constructed for irrigation water supply or as hazards will not be located in streams or wetlands on Class III trout waters. If ponds are proposed in streams or wetlands of Class I or IV waters, the following impacts must be addressed:

- a. Changes in organic material transport;
- b. Invertebrate drift;
- c. Fish passage; and
- d. Loss of wetland functions.

2. Ponds constructed in upland areas of Class III watersheds must be designed to avoid thermal impacts. This may be addressed by a pond designed to store up to and including a two-year storm with no discharge.

D. Forest Cover and Significant Habitats

1. The applicant should determine the percentage of the total site acreage that is forest cover. The design of the golf course should limit clearing of forest to 25% of the total forest acreage. If the design requires that more than 25% of the existing forest be cleared, an afforestation program must be implemented to replace any acreage over the 25% clearing limit. A reforestation in other parts of the watershed may be accepted to meet the percent forest cover requirements. A conceptual plan for how this requirement will be met is a condition of golf course approval.
2. Where significant plant and/or animal habitat are determined to exist on site, the applicant will design the golf course to preserve these areas.

E. Stormwater Management and Water Quality Management

1. The applicant will prepare concept plans for managing of stormwater runoff. Major consideration will be given to the control of streambank erosion and control of pollutants (nutrients and pesticides from fairways, tees and greens; and nutrients, metals and organic materials from roads and parking lots).
2. Emphasis should be placed on the use of a combination of methods, such as infiltration, grassed swales, shallow marsh, vegetated filter strips and forest buffers To provide water quality management. (Figures 5, 6, and 7.)
3. The current criteria for water quality is control of the first one-half inch of runoff from impervious areas. Management of a two-year storm is required to control for streambank erosion.

F. Stream Baseflow Depletion

1. Where irrigation wells are proposed, a stream depletion analysis may be required.
2. In the event that a depletion analysis is required, an assessment of the impacts of stream baseflow reductions on instream habitat will also be required. There are a number of methods used to determine the effects of stream flow reductions on instream habitat (i.e., Montana Method, Instream Flow Incremental Methodology, etc.).
3. The current criteria is maintenance of a baseflow that is 50% of the Mean Annual Flow (MAF).

III. SURFACE WATER MONITORING PROGRAM

A. The applicant will be required to conduct surface water monitoring for one (1) year prior release of grading permits and for three (3) years after the start-up of golf course operations.

B. This monitoring program will be developed in coordination with DEPRM and will include monitoring of: water quality, stream morphology, benthic macro-invertebrates and fisheries (Appendix A).

IV. INTEGRATED PEST MANAGEMENT PROGRAM (IPM)

The golf course applicant will develop in coordination with DEPRM an IPM program. Emphasis will be given to: 1) selection of drought and disease resistant grass species for fairways, tees and greens; 2) the use of biological controls instead of chemicals; 3) where pesticides are used, selection of those chemicals that are less toxic, less mobile and have a shorter half-life; 4) strict control over those pesticides in terms of location of application; and 5) identification of areas on a site that are particularly susceptible to ground water or surface water contamination.

SECTION 2. GROUND WATER PROTECTION

I. GENERAL REQUIREMENTS

A. Ground Water Quantity Issues

1. Aquifer Testing: A pump test should be established that ensures a sufficient water supply is available, and so that necessary values for transmissivity and storativity can be determined. The test should be coordinated through the Maryland Department of Natural Resources, Water Resources Administration. A minimum of two observation wells around the pumping well are required for drawdown measurements. Flow field characteristics for both pre- and post-golf course conditions should be evaluated. Note that pump tests must be conducted on all proposed wells.

2. Water Balance Assessment: A water balance assessment should be conducted. The assessment should evaluate all gains and losses to the ground water system. Surface runoff estimations should factor in soils, slope, vegetative cover and impervious surface. All plans for irrigation needs and domestic uses (club house, homesites, etc.) must be included.

3. Impact Analysis for Adjacent Well Supplies: The potential impact golf course ground water withdrawals will have on adjacent ground water supplies must be evaluated.

4. Stream Depletion Analysis: The potential impact of irrigation withdrawals on surface water baseflows must be evaluated.

B. Ground Water Quality Issues

1. Permeability Analyses: In situ permeabilities should be determined. Since nutrient and pesticide applications will likely be heaviest on greens and tees, testing should focus on those areas initially. In selecting depth and interval sampling, post-construction conditions should be considered.
2. Total Organic Carbon: Total organic carbon (TOC) is a significant factor with regard to attenuation of some pesticide compounds. TOC content should be evaluated in conjunction with the permeability determinations.
3. Baseline Water Quality: Baseline water quality should be evaluated to determine the impacts of the golf course on the ground water resources of the area. The number and location of sampling points is site specific; however, sample points should be representative of prior land use. On-site test wells should be sampled and analyzed quarterly for a minimum one year period to establish background water quality. Sample parameters should include inorganic chemistry, major ions, volatile priority pollutants, and pesticides. The number and type of pesticide parameter is also site specific and depends on prior land use.
4. Lakes and Ponds: Since lakes and ponds can function as open conduits to ground water, mitigative measures established. Mitigative measures include pond berming or synthetic liners.
5. Integrated Pest Management (IPM): An IPM plan is required as part of the standard operating procedure for the golf course operation.
6. Operational Ground Water Monitoring: Operational ground water monitoring is required to ensure the efficiency of the IPM plan and to permit sufficient remedial response time in the event ground water contamination occurs. Sampling locations may include monitoring wells and/or lysimeters. Parameters are the same as those used for baseline water quality definition. The only difference relates to pesticide monitoring. Pesticide parameters includes only those that have actually been used on the golf course. The number, location, and type of ground water sample points is site dependent and will be influenced by the DRASTIC index.

II DESIGN STANDARDS

- A. Greens and tees should be located in areas where the maximum high water table or bedrock is greater than four feet below the surface. Field determination of high bedrock and/or ground water should be conducted with respect to the final grading of those locations.
- B. Underdrain systems for greens and tees must also maintain four feet of soil separation between the subsurface leaching system and high bedrock and/or ground water. Field verification is required.